



**NATIONAL OPEN UNIVERSITY OF NIGERIA**  
**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI-ABUJA**  
**FACULTY OF SCIENCES**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**2024 1 EXAMINATION**

**COURSE CODE** : CIT 335  
**COURSE TITLE** : Computational Science and Numerical Methods  
**CREDIT UNIT** : 3  
**TIME ALLOWED** : 2½ HOURS  
**INSTRUCTION** : Answer Question 1 and any other Three Questions

**1a) Write short notes on the following operators used in programming:**

i) DIV ii) MOD

**1b) Convert the following numbers to floating point representation**

i) 168,500 ii) 0.0378462 iii) - 0.00746

**1c) Convert the following binary numbers to base 10**

i.  $(11001.10)_2$  ii.  $3107_{16}$

**1d) Mention any two ways of reducing the number of digits in a numerical value?**

**1e) Round the following numbers to 4 decimals**

i)  $6.322556 = 6.3226$ , ii)  $6.323501 = 6.3235$

**1f. Using a well-labelled diagram, describe the black box representation of a problem**

**2a) State the formal definition of condition number:**

condition number is formally defined as the value of the asymptotic worst-case relative change in output for a relative change in input.

**2b) Convert the following numbers to base 10:**

i)  $(101.101)_2$  ii)  $(ADE)_{16}$

**2c) With the aid a well-labeled diagram, state the Mean Value theorem of differential calculus.**

**3a) Write short notes on the following**

i) Complex floating Point number ii) rational arithmetic iii) Euclidean algorithm  
iv) Interval arithmetic

**3b) Explain the difference between decimal and binary number representations.**

**3c) Convert the following numbers to floating point representation**

i) 168,500 ii) 0.0378462 iii) - 0.00746

**3d) Round the following numbers to 4 decimals:**

i) 1.23767 ii)  $0.774539 = 0.7745$ ,

**4a) Briefly describe the condition number of a function**

**4b) Multiply of floating-point numbers A and B, where  $A=-18.0$  and  $B=9.5$**

**4c) Convert  $1/3$  to floating point using seven digits of precision and compute the Absolute errors and Relative errors**